

**What is claimed is:**

1. Apparatus, for mounting on an aircraft, for detecting hazardous materials, comprising:

a global positioning system unit,

a heading module, and

5 a sensor having a probe, an electronics module, and means for measuring airspeed, said probe being mounted to protrude outside the skin of said aircraft, and including an enclosed, positive airflow, sensing chamber with a sensing element for a selected hazardous material mounted  
10 therein, said electronics module being connected to and configured to receive input from said global positioning system unit, said heading module, said sensing element and said means for measuring airspeed, said electronics module being configured to output data including position,  
15 altitude, wind velocity and hazardous material detection information,

whereby distribution of said selected hazardous material may be mapped and dispersion of said selected hazardous material may be predicted.

2. Apparatus as set forth in Claim 1 including a transceiver connected to said electronics module for transmitting said data to a ground network.

3. Apparatus as set forth in Claim 2 wherein said global positioning system unit and said electronics module are a combined unit.

4. Apparatus as set forth in Claim 1 wherein said probe has an airfoil shape, and includes an outwardly located flow tube opening in the direction of airflow with

said chamber being connected to and extending inwardly from  
5 said flow tube, and an inwardly located outlet hole  
connected to said chamber opposite said flow tube and  
opening transverse to the direction of airflow.

5. Apparatus as set forth in Claim 4 wherein said  
means for measuring airspeed includes a forwardly opening  
pitot tube and pair of spaced, side opening static ports,  
in said probe, all connected to a differential pressure  
5 sensor in said electronics module.

6. Apparatus as set forth in Claim 5 wherein said  
static ports are connected to a static pressure sensor in  
said electronics module.

7. Apparatus as set forth in Claim 1 wherein said  
probe includes a temperature sensor and a humidity sensor,  
each located in said chamber and connected to said  
electronics module.

8. Apparatus as set forth in Claim 1 wherein said  
sensing element is a plug-in, chip based hazardous agent  
sensor.

9. Apparatus, for mounting on an aircraft, for  
detecting hazardous materials, comprising:

a global positioning system unit,  
a heading module,

5 a sensor having an airfoil shaped probe mounted to  
protrude outside the skin of said aircraft, and an  
electronics module, said probe having an outwardly located  
flow tube opening in the direction of airflow, an inwardly  
extending, enclosed, positive airflow, sensing chamber  
10 connected to said flow tube and at least one inwardly

located outlet hole connected to said chamber opposite said flow tube, opening transverse to the direction of airflow, a forwardly opening pitot tube, and pair of spaced, side opening static ports, said chamber having a plug-in, chip based sensing element for a selected hazardous material, a temperature sensor and a humidity sensor mounted therein, said electronic module having a static pressure sensor connected to said static ports and a differential pressure sensor connected to said pitot tube and said static ports, said electronics module being connected to and configured to receive input from said global positioning system unit, said heading module, said sensing element, said temperature sensor, and said humidity sensor, said electronics module being configured to output data including position, altitude, wind velocity, temperature, humidity and hazardous material detection information, and a transceiver connected to said electronics module for transmitting said data to a ground network, whereby distribution of said selected hazardous material may be mapped and dispersion of said selected hazardous material may be predicted.

10. A method of predicting hazardous material dispersion comprising the steps of:

providing aircraft with hazardous material sensing apparatus for sensing position, altitude, wind velocity and a hazardous material mounted thereon, collecting position, altitude, wind velocity and hazardous material data with said sensing apparatus while said aircraft flies, and

mapping distribution of said hazardous material and  
10 wind velocity from said data to predict dispersion of said  
hazardous material.

11. The method as set forth in Claim 10 including the  
steps of

providing a ground network, and  
transmitting said data from said aircraft to said  
5 ground network for said step of mapping.

12. The method as set forth in Claim 10 wherein said  
step of mapping includes receiving weather forecast  
information from a weather forecast service and combining  
said forecast information with said data.

13. The method as set forth in Claim 10 wherein said  
sensing apparatus includes a global positioning system  
unit, a heading module and a sensor connected to said  
global positioning system unit and said heading module,  
5 said sensor having an airfoil shaped probe mounted to  
protrude outside the skin of said aircraft and an  
electronics module, said probe including an enclosed,  
positive airflow, sensing chamber with a sensing element  
for said hazardous material mounted therein.

14. A method of predicting hazardous material  
dispersion comprising the steps of:

providing aircraft with hazardous material sensing  
apparatus for sensing position, altitude, wind velocity and  
5 a hazardous material mounted thereon, including a global  
positioning system unit, a heading module and a sensor  
connected to said global positioning system unit and said  
heading module, said sensor having an airfoil shaped probe  
mounted to protrude outside the skin of said aircraft and

10 an electronics module, said probe including an enclosed,  
positive airflow, sensing chamber with a sensing element  
for said hazardous material mounted therein,  
collecting position, altitude, wind velocity and  
hazardous material data with said sensing apparatus while  
15 said aircraft flies,  
providing a ground network,  
transmitting said data from said aircraft to said  
ground network,  
receiving weather forecast information from a weather  
20 forecast service,  
combining said forecast information with said data,  
and  
mapping distribution of said hazardous material and  
wind velocity from said forecast information and said data  
25 to predict dispersion of said hazardous material.

15. A system for detecting and mapping distribution of  
a hazardous material comprising:

aircraft mounted sensing apparatus configured to  
collect position, altitude, wind velocity and hazardous  
5 material data, and including a global positioning system  
unit, a heading module, a transceiver and a sensor having a  
probe and an electronics module, said probe being mounted  
to protrude outside the skin of said aircraft, and  
including an enclosed, positive airflow, sensing chamber  
10 with a sensing element for said hazardous material mounted  
therein and pressure, temperature and humidity sensors,  
said electronics module being connected to and configured  
to receive input from said global positioning system unit,  
said heading module, and said probe, and to output said

15 data, said transceiver being configured to transmit said data, and

a ground network configured to receive said data and, from said data, to map distribution and predicted dispersion of said hazardous material.

16. The system as set forth in Claim 15 wherein said probe has an airfoil shape, and includes an outwardly located flow tube opening in the direction of airflow with said chamber being connected to and extending inwardly from  
5 said flow tube, and at least one inwardly located outlet hole connected to said chamber opposite said flow tube and opening transverse to the direction of airflow.

17. The method as set forth in Claim 15 wherein said sensing element is a plug-in, chip based hazardous agent sensor.